MISSISSIPPI SYSTEM

Upper Mississippi and Missouri Basins.—Temperatures considerably above normal throughout the Upper Mississippi and Missouri River Basins caused an early spring break-up. The rapid thawing of the snow combined with above normal precipitation, except in southwestern South Dakota and western Nebraska, produced extremely heavy run-off. Ice was unusually heavy in many streams, particularly in the Missouri River Basin, and local flooding resulted from backwater from ice gorges that formed during the break-up. Ice was heavy in the Knife and Heart River Valleys, causing ice jams and heavy local flooding. The most serious damage occurred along the highway between Bismarck and Mandan, N. Dak., because the ice and water could not get into the frozen Missouri River. The highway and adjacent bottom lands were completely covered with cakes of ice from 1 to nearly 3 feet in thickness. The highway was covered with about 4 feet of water from March 13 through March 18 and was opened for traffic on the 19th. Property damage along the Heart River amounted to about $60,000.

An ice gorge also developed on the main Missouri River at what is known as Michaelsen Bend about 5 miles below Blair, Nebr., causing a rise at Blair on the 12th. A stage of 19.25 feet, believed to be approximately the crest, was reached about noon. By 6 p. m. the river had fallen to a stage of 17.2 feet.

Flood stages were experienced in many of the Mississippi and Missouri River tributaries in Minnesota, Wisconsin, North and South Dakota, Iowa, Nebraska, Kansas, Missouri, and Illinois, as shown by the table at the end of this report. Flood stages were also exceeded on the Mississippi River from Minneapolis, Minn., downstream and on the Missouri River at and below Waverly, Mo.

Damage from these overflows was comparatively light since they occurred well in advance of the crop season, in contrast to the floods of May and June 1944. There was some damage to bridges, highways, fences, railroads, etc., mainly from ice action, but aggravated by rapidly rising water.

THE OHIO RIVER FLOOD OF MARCH 1945

At the great industrial center of Pittsburgh, Pa., the waters of the Allegheny and Monongahela Rivers join to form the Ohio River, one of America's most picturesque streams and a very important inland waterway. From Pittsburgh, the Ohio River flows in a general southwesterly direction to its confluence with the Mississippi at Cairo, Ill., a distance of 981 miles, through a relatively narrow valley with a gentle slope throughout its length, except in the vicinity of Louisville, Ky., where there is a fall of 26 feet in 3 miles. The average fall of the river is about 0.4 foot per mile. The river is controlled at low stages by navigation improvements of the U. S. Engineers and never goes below the 9-foot navigation stage, but at appreciably higher stages the navigation dams are lowered, allowing the water to flow freely.

The Ohio Basin, embracing parts of 14 States, is a densely populated region, one of the principal industrially developed areas in the United States. It is also noted for its rich agricultural lands. Because of the large and extensively developed coal fields in the basin, the outstanding development has been the iron and steel industry centered at Pittsburgh, and extending up the Monongahela and down the Ohio. Cincinnati, Louisville, and Wheeling are only a few of the other centers of industry on the river. Railroads, highways, and other public developments, as well as industries and private improvements, have been located along the river, largely through necessity, and many are susceptible to flooding. However, flood protective works built along the river front at many points in recent years serve to reduce the damage from floods.

The Ohio Basin receives a greater annual precipitation (an average of 44 inches) than any other major subdivision of the Mississippi System, except the Lower Alluvial Valley of the Mississippi. The annual amount varies from 80 inches in portions of the southern Appalachians to 35 inches in the northwestern section of the basin. Flood stage is reached or exceeded at some point along the Ohio practically every year. Damaging floods which have exceeded flood stage by 5 feet or more over considerable stretches of the river have occurred about 30 times in the last 64 years. Property damage from floods ranks higher in the Ohio Basin than in any other major river basin in the country. For the 30-year period from 1924 to 1943, inclusive, the property loss from floods in the Ohio Basin amounted to approximately $670,000,000 with loss of life of 472 persons. Of the property damage, more than $400,000,000 occurred in the flood of 1937 alone. (See MONTHLY WEATHER REVIEW SUPPLEMENT No. 37, the Ohio and Mississippi River Floods of January-February 1937, by Bennett Swenson, for a report of this flood.) Other outstanding floods during the last 64 years occurred in 1936, 1913, 1907, 1884, and 1883.

The Ohio River normally shows a rise in stage during the winter months, reaching a peak in March and falling steadily to the lowest point during the summer months. The past 12-month period was no exception to this rule; in fact, it was an extreme example. Most of the Ohio Basin suffered from a serious drought after May 1944, resulting in relatively low river stages. A series of heavy rains from the second week of February to March 7 over most of the Ohio River Basin, aided to some extent by snow-melt in northern sections, produced a major flood in the Ohio River during March. Rapidly rising flood waters resulted in loss of life and heavy damage by flooding of large areas of low farmlands, by closing of coal mines and many industrial plants manufacturing essential war

TABLE I.—*Snowfall in Upper Ohio Basin, 1944–45*

Station	Inches				
	December	January	February	March	Total
Port Allegany, Pa.	20.0	18.0	10.0	12.0	60.0
Olean, N. Y.	29.0	20.0	10.3	14.8	74.1
Warren, Pa.	33.5	18.5	11.5	2.0	65.5
Meadville, Pa.	47.3	27.2	15.5	5.5	95.5
Franklin, Pa.	37.0	20.0	10.5	5.5	73.0
Glen Hazel (nr.), Pa.	30.8	22.0	11.3	6.5	70.6
Ridgway, Pa.	30.0	19.5	10.0	3.0	62.5
Clarion, Pa. (Piney)	35.2	17.0	8.3	4.5	65.0
Parkers Landing, Pa.	28.0	18.0	3.0	1.0	50.0
DuBois, Pa.	40.0	25.4	11.8	3.5	80.7
Punxsutawney, Pa.	25.4	27.7	10.0	2.4	65.5
Mosgrove, Pa.	24.5	14.8	4.3	T	43.6
Hooversville, Pa.	37.7	25.4	9.3	1.5	73.9
Ebensburg, Pa.	28.1	16.0	4.6	1.3	50.0
Seward, Pa.	31.0	28.0	6.0	3.0	68.0
Blairsville, Pa.	38.3	31.4	9.9	4.5	84.1
Boswell (nr.), Pa.	53.0	52.0	19.0	8.0	132.0
Latrobe, Pa.	27.0	17.3	5.2	T	49.5
Saltsburg, Pa.	30.5	27.0	6.0	T	63.5
Vandergrift, Pa.	23.0	13.4	3.8	T	40.2
Schenley, Pa.	26.8	15.0	3.1	T	44.9
Natrona, Pa.	27.5	22.1	4.3	T	53.9
Lake Lynn, Pa.	14.0	11.5	2.2	4.0	31.7
Greensboro, Pa.	26.2	17.6	7.2	0.8	51.8
Meyersdale, Pa.	37.5	21.0	10.0	3.0	71.5
Confluence, Pa.	27.0	14.2	7.8	1.0	50.0
Sutersville, Pa.	26.0	14.5	4.5	T	45.0
McKeesport, Pa.	21.5	14.5	2.5	T	38.5
Bruceton, Pa.	23.7	19.9	5.7	2.0	51.3
Pittsburgh, Pa.	26.0	19.2	3.8	T	49.0
Beaver Falls, Pa.	20.5	15.2	2.5	1.0	39.2
Midland, Pa.	24.0	17.3	2.5	4.0	47.8
Claysville, Pa.	27.8	16.7	4.0	1.0	49.5
Somerset, Pa.	39.1	16.0	11.0	3.0	69.1

materials, and by disrupting transportation and flooding of many homes. According to records of the American Red Cross, 24 lives were lost as a result of the flood.

Large accumulations of snow were present during January in western Pennsylvania and western New York with heavy ice in many of the streams, particularly in the Allegheny River. The snow cover by early February was as great as and in some places exceeded the accumulations that prevailed prior to the disastrous flood of March 1936. Table I gives a record of the snowfall for the season December 1, 1944, to March 31, 1945, at selected stations in the upper Ohio Basin.

Fortunately, the sequence of weather events beginning in mid-February of this year, which included short periods of mild weather and moderate rainfall followed by freezing weather, allowed the Allegheny and Monongahela Rivers to disgorge much of the melted snow without excessive damage. The alternate periods of mild-rainy and cold weather show clearly on the hydrograph of the river stage at Pittsburgh, Pa., which shows no less than five crests between February 23 and March 7.

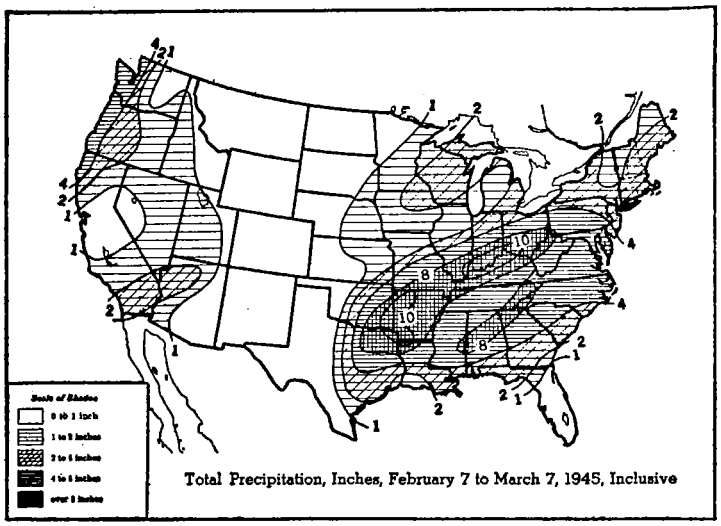

FIGURE 1.—Chart of flood-producing rain.

The rise in the Ohio River began in mid-February as a result of heavy rains in the Ohio Basin. As heavy rains continued intermittently, the river rose steadily, exceeding the established flood stage of 40 feet at the mouth of the Ohio River at Cairo, Ill., on February 23. Two days later the river reached flood stage at Evansville, Ind., and on the 27th and 28th the flood level was exceeded at Cincinnati, Ohio, and at Pittsburgh, Pa. By the 4th and 5th of March the entire Ohio River was in flood. On March 5–6, the final rainstorm of the series occurred immediately along the entire Ohio River, causing the river to rise sharply. Total rainfall during the period February 7 to March 7 exceeded 8 inches over a wide belt, centering over the main stem of the Ohio River and extending from Cairo, Ill., to Pittsburgh, Pa. The total rainfall for this period is shown graphically by figure 1. For additional precipitation data, the reader is referred to the HYDROLOGIC BULLETINS and CLIMATOLOGICAL DATA that are published monthly by the Weather Bureau.

The following summary of the flood in the Cincinnati district was prepared by George R. Marth, river forecaster of the Cincinnati Weather Bureau Office:

> The February–March 1945 Ohio River Flood in the Cincinnati district was caused by the frequent heavy rains from February 13 to March 7. Total rainfall over this district during that period ranged from 5 to 11 inches, with the heaviest (10 to 11 inches) being centered along the Ohio River and lower reaches of the tributaries, decreasing to near 5 inches over the tributary headwaters, except locally over the Kentucky River. Toward the close of February, the Ohio River throughout this district had risen to within 10 feet of flood stage as a result of moderately heavy and well distributed rains since February 13. Three closely spaced storms followed on February 25–26, March 2–3 and 5–6, each producing heavy to excessive rainfall along the Ohio River, the over-all total averaging 7–8 inches. Each of these storms caused a distinct rise to a higher crest and the flooded river had little or no opportunity to run out before the succeeding storm moved into the valley. As a result, stages rose to heights which finally crested as the fourth highest flood of record, being exceeded only by the floods of March–April 1913, February 1884, and January 1937. No rainfall of consequence occurred from March 7 to 18 and the Ohio River in this district fell below flood stage on March 14–16.
>
> In addition to the Ohio River, the following tributaries in this district were in flood as indicated: Licking River at Falmouth and below: Kentucky River at Frankfort and below (also at Jackson on the North Fork); Little Miami River; the extreme lower reach of the Great Maimi River; and all creeks including a severe "flash flood" on Mill Creek in the industrial area of Cincinnati.
>
> An unusual feature of this flood is revealed in the fact that although a major flood developed on the Ohio River, no extremely high stages occurred on the larger tributaries, flooding on these streams being confined to the lower reaches. Another interesting feature in the Cincinnati district was the similarity to the January 1937 flood in the final cresting. At and below Dam 35 the river crested without any effect from the upper Ohio, and nearly 2 days before crests occurred above Dam 35 to Portsmouth. The heavier rain over the lower reach of the district resulted in rapid run-off and unusually high stages compared to the upper portion. This provided for considerable storage in the reach above Dam 35, where the rise from the upper Ohio was absorbed. Final crests in that reach were thus delayed about 2 days by the normal lag in travel time on the upper Ohio River.
>
> The discharge of the Ohio River at Cincinnati at the time of crest was approximately 690,000 c. f. s.

The flood was relatively more severe on the main stream than on the tributaries, none of which were reported in extreme flood. The flood peaks on the Ohio were several feet below the maximum flood of record, but they rank generally among the first four or five of the greatest floods. At Parkersburg, W. Va., the crest was the seventh highest of record, while at Louisville, Ky., the crest was exceeded only by the flood of 1937. A comparison of this flood at a number of points with other floods of recent years is shown by table II.

TABLE II.—*Comparison of Ohio River Floods*

Station	Flood stage	1913		1936		1937		1942-43		1945		Highest of record	
		Stage	Date	Stage	Date	Stage	Date	Stage	Date	Stage*	Date	Stage	Year
Pittsburgh, Pa	25	34.5	Jan. 9	46.0	Mar. 18	34.5	Jan. 26	36.6	Dec. 31	33.4	Mar. 7	46.0	1936
Wheeling, W. Va	36	51.1	Mar. 28	55.2	Mar. 19	48.7	Jan. 26	51.5	Dec. 31	47.3	Mar. 8	55.2	1936
Parkersburg, W. Va	36	58.9	Mar. 29	48.0	Mar. 20	55.4	Jan. 26	49.0	Jan. 1	48.5	Mar. 9	58.9	1913
Point Pleasant, W. Va	40	62.8	Mar. 30	54.4	Mar. 22	62.7	Jan. 27	54.7	Jan. 2	53.0	Mar. 9–10	62.8	1913
Portsmouth, Ohio	50	67.9	Mar. 31	59.2	Mar. 23	74.2	Jan. 27	61.2	Jan. 3	64.9	Mar. 9	74.2	1937
Cincinnati, Ohio	52	69.9	Apr. 1	60.6	Mar. 28	80.0	Jan. 26	60.8	Jan. 4	69.2	Mar. 7	80.0	1937
Louisville, Ky. (upper gage)	28	44.9	Apr. 2	36.6	Mar. 29	57.1	Jan. 27	38.0	Mar. 23–24	47.1	Mar. 8	57.1	1937
Evansville, Ind	37	48.4	Apr. 5	44.4	Mar. 31	53.75	Jan. 31	45.2	Mar. 26	48.3	Mar. 12	53.75	1937
Paducah, Ky	39	54.3	Apr. 7	48.2	Apr. 7	60.6	Feb. 2	46.0	Mar. 30	50.5	Mar. 10	60.6	1937
Cairo, Ill	40	54.7	Apr. 7	52.2	Apr. 8	59.5	Feb. 3	53.0	May 30	53.9	Mar. 11	59.5	1937

*Provisional.

The main tributaries of the Ohio were in moderate flood, especially in the lower reaches. The tributaries in southern Ohio reached the highest stages of record during the last 20 years at some stations, but no floods equaled the 1913 records. The streams in Indiana were also at moderately high stages and the third largest flood of record was recorded in the lower portion of the Green River in Kentucky.

White and Arkansas Basins.—Rainfall over Arkansas during March was unusually heavy, averaging over 11 inches for the entire State. Amounts totaled as much as 18 inches, with many stations recording 15 inches or more. All rivers in Arkansas exceeded flood stage. Two or more rises occurred on all the rivers, and the lower portions of the White and Ouachita Rivers were in flood the entire month. Recurring floods occurred on the Poteau River and on the Arkansas below Muskogee, Okla., to Van Buren, Ark. Flood stages were also reached on the Neosho River from Burlington to Oswego, Kans. The floods on the Neosho and Arkansas were not severe; flood stages were exceeded by only 1 or 2 feet generally. Additional heavy rain fell over the South-central States on March 30–April 1, resulting in the highest stages of record in several streams of this area.

Red and Lower Mississippi Basins.—The Red River was at moderately high stages during the entire month. Flood stage was exceeded on several occasions in the upper river and at and below Grand Ecore, La., flood stages prevailed throughout the month and into April. Additional heavy rain at the end of March produced record stages at many points on the river during April. The lower Mississippi and Atchafalaya Rivers rose gradually during March as the flood waters of the Ohio joined with those of the upper Mississippi and Missouri Rivers. Flood stages on the lower Mississippi were generally exceeded by the middle of March. Excessive flows of tributaries draining Arkansas, Louisiana, and Mississippi, where rainfall was especially heavy during late March and early April, produced stages by mid-April on the lower Mississippi River that exceeded somewhat the stages reached by the flood of 1937. (See chart showing total precipitation for March.) The crest at New Orleans, La., was expected to be held below a critical stage of 20 feet by operation of the Bonnet Carre Spillway which can divert a maximum flow of 250,000 c. f. s. to Lake Pontchartrain.

West Gulf of Mexico Drainage.—Streamflow in eastern Texas was high during March with considerable flooding throughout the month. Heavy rains of March 30 and 31 fell over the entire eastern half of the State and exceeded 8 inches over a wide area of the upper Trinity, Neches, Sabine, Cypress Creek, and Sulphur River Basins in northeastern Texas. Record stages were reached on many streams by early April.

FLOOD-STAGE REPORT FOR MARCH 1945

[All dates in March unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest [1]	
		From—	To—	Stage	Date
HUDSON BAY DRAINAGE					
Red of North:	*Feet*			*Feet*	
Wahpeton, N. Dak.	6	16	20	7.2	18
Moorhead, Minn.	17	16	29	26.6	22
Grand Forks, N. Dak.	25	24	Apr. 2	32.0	30
ST. LAWRENCE DRAINAGE					
Lake Erie					
	Feet			*Feet*	
St. Marys: Decatur, Ind.	13	31	[2]		
Sandusky: Upper Sandusky, Ohio	13	21	21	13.8	21
ATLANTIC SLOPE DRAINAGE					
Kennebec: Augusta, Maine	13	30	[2]		
Pemigewasset: Plymouth, N. H.	11	21	21	11.0	21
Connecticut:					
South Newbury, Vt.	22	20	22	22.2	20–22
		29	Apr. 2	25.5	30
White River Junction, Vt.	18	22	22	18.0	22
Montague City, Mass.	28	21	23	29.6	22
		19	26	18.3	20
Hartford, Conn.	16	29	Apr. 3	20.9	23
				17.5	31
Tioughnioga: Whitney Point, N. Y.	12	4	4	12.7	4
		16	25	14.4	17
				13.5	22
Chenango:					
Sherburne, N. Y.	8	3	4	8.5	3
		16		8.9	17
				9.0	22
Greene, N. Y.	8	3	4	8.6	4
		16	24	10.7	18
				10.2	22
Binghamton, N. Y.	16	17	19	17.2	18
		21	23	17.5	22
Chemung: Chemung, N. Y.	12	4	4	15.8	4
		17	17	12.3	17
		22	22	14.0	22
Susquehanna:					
Oneonta, N. Y.	12	3	9	15.7	4
				14.7	7
		16	20	15.6	18
		21	25	15.1	22
Bainbridge, N. Y.	12	3	5	16.1	4
		17	20	13.8	18
		22	22	12.5	22
Vestal, N. Y.	14	4	7	16.6	5
				16.2	6
		16	25	19.1	18
				19.0	22
Towanda, Pa.	16	4	4	16.2	4
James: Columbia, Va.	10	6	9	12.5	8
Roanoke: Williamston, N. C.	10	Feb. 18	14	12.2	Feb. 27–28
Tar: Greenville, N. C.	13	Feb. 25	2	13.7	Feb. 28
Neuse:					
Goldsboro, N. C.	14	Feb. 23	4	16.1	2
Kinston, N. C.	14	1	6	14.5	4
PeeDee: Mars Bluff Bridge, S. C.	17	Feb. 21	6	19.6	Feb. 28
Saluda: Pelzer, S. C.	6	27	28	7.5	28
Ocmulgee: Abbeville, Ga.	11	Feb. 27	4	11.5	2
Altamaha: Charlotte, Ga.	12	Feb. 27	9	13.7	5
EAST GULF OF MEXICO DRAINAGE					
Apalachicola: Blountstown, Fla.	15	Feb. 20	9	19.4	Feb. 26
Black Warrior:					
Lock No. 10, Tuscaloosa, Ala.	47	5	7	52.7	6
Lock No. 7, Eutaw, Ala.	35	Feb. 14	2	46.6	Feb. 25
		5	12	44.9	8

See footnotes at end of table.